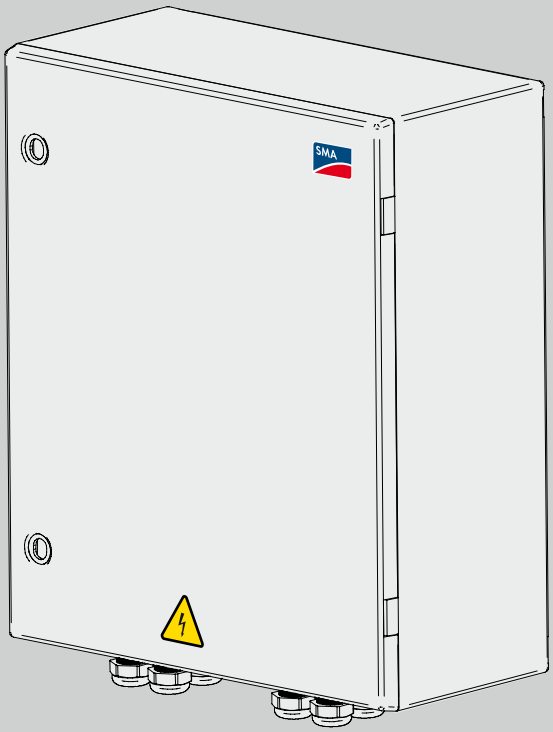
Installation Manual

SMA STRING-COMBINER

DC-CMB-U10-16 / DC-CMB-U10-24 / DC-CMB-U10-32



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1 Information on this Document

Validity

This document is valid for the following device types:
- DC-CMB-U10-16
- DC-CMB-U10-24
- DC-CMB-U10-32

Target Group

This document is intended for qualified persons. Only persons with the appropriate skills are allowed to perform the activities described in this document (see Section 2.2 “Skills of Qualified Persons”, page 5).

Additional Information

Links to additional information can be found at www.SMA-Solar.com.

Symbols

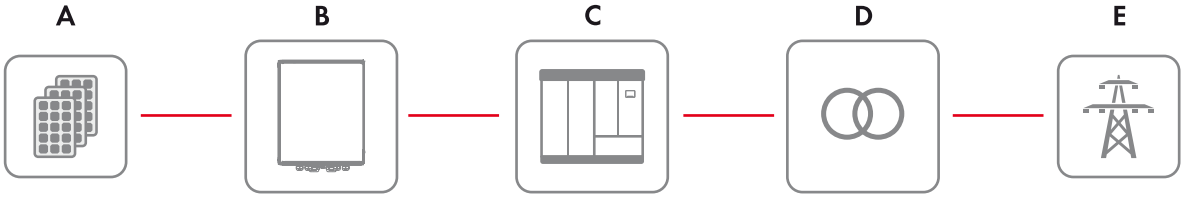
Symbol	Explanation
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, can result inminoror moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
	Packaging instructions
	Describes the installation procedure of the product
	Describes the use of the product and its graphic display
	Contains useful information for disposing of the product

Nomenclature

This document is relevant for the SMA String-Combiner Box for Utility Power System.
They are jointly referred to in the following as “Combiner Box”.

2 Safety

2.1 Intended Use



Position	Explanation
A	PV array
B	Combiner Box
C	Sunny Central
D	Transformer
E	Utility grid

2.2 Skills of Qualified Persons

The tasks described in this document must be performed by qualified persons only. Qualified persons must have the following skills:

- Knowledge of how the device works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and systems
- Training in the installation and commissioning of electrical devices
- Knowledge of all applicable standards and directives
- Knowledge of and compliance with this document and all safety precautions

2.3 Instructions and Warnings

Failure to follow these instructions may have serious consequences, such as the destruction of the device, personal injury or death due to electric shock. Therefore, the following safety instructions must be read and understood prior to installation and use of the Combiner Box. For any clarifications or additional information, contact the SMA technical service.

Symbol	Explanation
	Once the product has been removed from its original packaging, visually inspect for damage that may have occurred during shipment. If damage is found, contact the distributor or manufacturer.
⚠ DANGER	This product must only be used for the purpose for which it has been designed. Any other use is considered improper and therefore dangerous. The manufacturer is not liable for possible damage caused by improper, incorrect or unreasonable use.
⚠ DANGER	SMA holds itself responsible only for the product in its original configuration. SMA declines all responsibility for consequences deriving from non-original spare parts.
⚠ WARNING	Any intervention that alters the structure or the operating cycle of the product must be carried out or authorized by SMA Solar Technology AG.
⚠ CAUTION	This manual is an integral and essential part of the product. Carefully read the recommendations contained in it since they provide important information on safe use and maintenance.
NOTICE	SMA may make technical changes in this manual and to the product at any time without notice. In case of typing errors or other types of errors, the corrections will be included in the new versions of the manual.

2.4 Position and securing

Failure to follow these instructions may have serious consequences, such as the destruction of the device, personal injury or death due to electric shock. Therefore, the following safety instructions must be read and understood prior to installation and use of the Combiner Box. For any clarifications or additional information, contact the SMA Solar Technology AG.

Symbol	Explanation
NOTICE	The enclosure is made of fibreglass with protection rating of IP54.
NOTICE	If positioning in a closed environment, make sure the area is ventilated and allows regular recirculation of air. If installing in an open environment, position the enclosure in an area that is constantly shaded and protected from exposure to direct sunlight. These measures are important for preventing unnecessary and excessive overheating, which prolonged in time impairs the duration and operation of parts inserted inside, since the enclosure supports the correct dissipation of heat developed by the energy coming from the strings at a maximum temperature of 50°C (60% with derating of 1%/K of max current).
NOTICE	The symbol ⧈ indicates that the enclosure is constructed in such a way that it provides protection against indirect contacts via complete insulation (EN 61439-2). For this purpose, the electrical equipment must be correctly installed according to the instructions that accompany the product and using the special accessories (screw cover caps, mounting brackets).
NOTICE	Make sure the wall where the enclosure is to be mounted is suitable to support the weight. The weight of these enclosure varies from 24 kg for the 16 string model to over 30 kg for the model with 32 strings.

2.5 Safety Precautions

This section contains safety precautions that must be observed at all times when working on or with the product.
To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and follow all safety precautions at all times.

⚠ DANGER

Danger to life from electric shock due to live voltage

High voltages are present in the live components of the Combiner Box. Touching live components results in death or serious injury due to electric shock.

- Wear personal protective equipment when working on the Combiner Box.
- Do not touch live components.
- Before performing any work, always disconnect the Combiner Box from voltage sources unless supply voltage is absolutely necessary.
  – Switch off the DC load-break switch in the Combiner Box.
  – With power off, remove the DC fuses in the central inverter or main DC distribution box. Use the LV/HRC fuse handle to do this.
  – Only open the fuse holders when the Combiner Box is switched off.
- Ensure that the device cannot be reconnected.
- Ensure that no voltage is present.
- Ground and short-circuit.
- Cover or isolate any adjacent live components. Protective covers must always be mounted.

Danger to life from electric shock due to live DC cables

DC cables connected to PV modules that are exposed to sunlight carry live voltage. Touching live DC cables results in death or serious injury.

- Prior to connecting the DC cables, ensure that the DC cables are voltage-free.
- Wear suitable personal protective equipment when working on the Combiner Box.

⚠ DANGER

Danger to life from electric shock due to ground fault

In the event of a ground fault, grounded PV systems can still be live. Touching system components that have not been properly grounded results in death or serious injuries from electric shock.

- Before working on the PV system, ensure that no ground fault is present.
- Wear suitable personal protective equipment for all work on the device.

Danger to life from electric shock if the Combiner Box is damaged

If the Combiner Box is damaged, dangerous situations may arise during operation that result in death or serious injury from electric shock.

- Only use the Combiner Box when it is in a technically faultless condition and safe to operate.
- Regularly check the Combiner Box for visual damage.
- Make sure that all external safety equipment is freely accessible at all times.
- Make sure that all safety equipment is in good working order.

⚠ WARNING

Danger to life from electric shock if the Combiner Box is left unlocked

If the Combiner Box is unlocked, unauthorized persons will have access to components carrying lethal voltages. Touching live components can result in death or serious injury due to electric shock.

- Always lock the Combiner Box.
- Remove the keys from the door locks.
- Keep the keys in a safe place.

Risk of fire due to failure to observe torque specifications on live bolted connections

Failure to follow the specified torques reduces the capacity of live bolted connections so that the contact resistances increase. This can cause components to overheat and catch fire.

- Ensure that live bolted connections are always tightened with the exact torque specified in this document.
- When working on the device, use suitable tools only.
- Avoid repeated tightening of live bolted connections, as this may result in inadmissibly high torques.

⚠ CAUTION

Risk of burns due to hot components or devices

Some components of the Combiner Box can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on the components.
- During operation, do not touch any components or devices marked with such warnings.
- After disconnecting the PV system from voltage sources, wait until all hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the device.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

DC-CMB-U10-16/24/32 for Wall Mounting

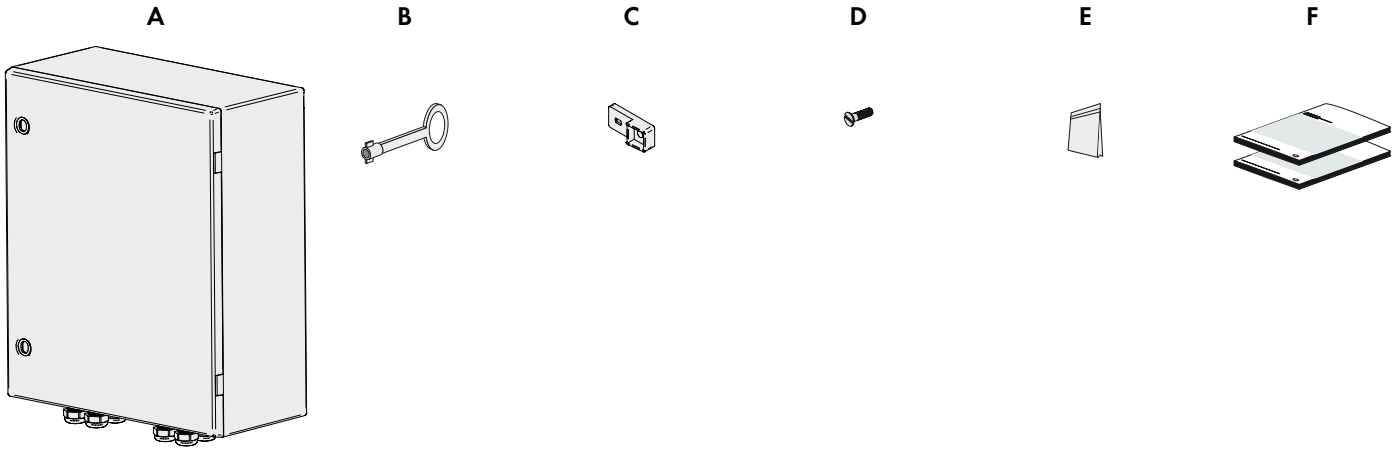


Figure 2: Components included in the scope of delivery for wall mounting

Position	Quantity	Designation
A	1	DC-CMB-U10-16/24/32 Combiner Box
B	1	Combiner Box door key
C	4	Wall mounting rail
D	4	Screw for the wall mounting rail
E	1	Caps and reducing inserts kit
F	1	Installation manual, circuit diagram, test report, declaration of conformity

4 Product Description

4.1 Combiner Box DC-CMB-U10-16/24/32

The DC-CMB-U10-16/24/32 Combiner Box is a PV array junction box to which several strings can be connected in parallel.

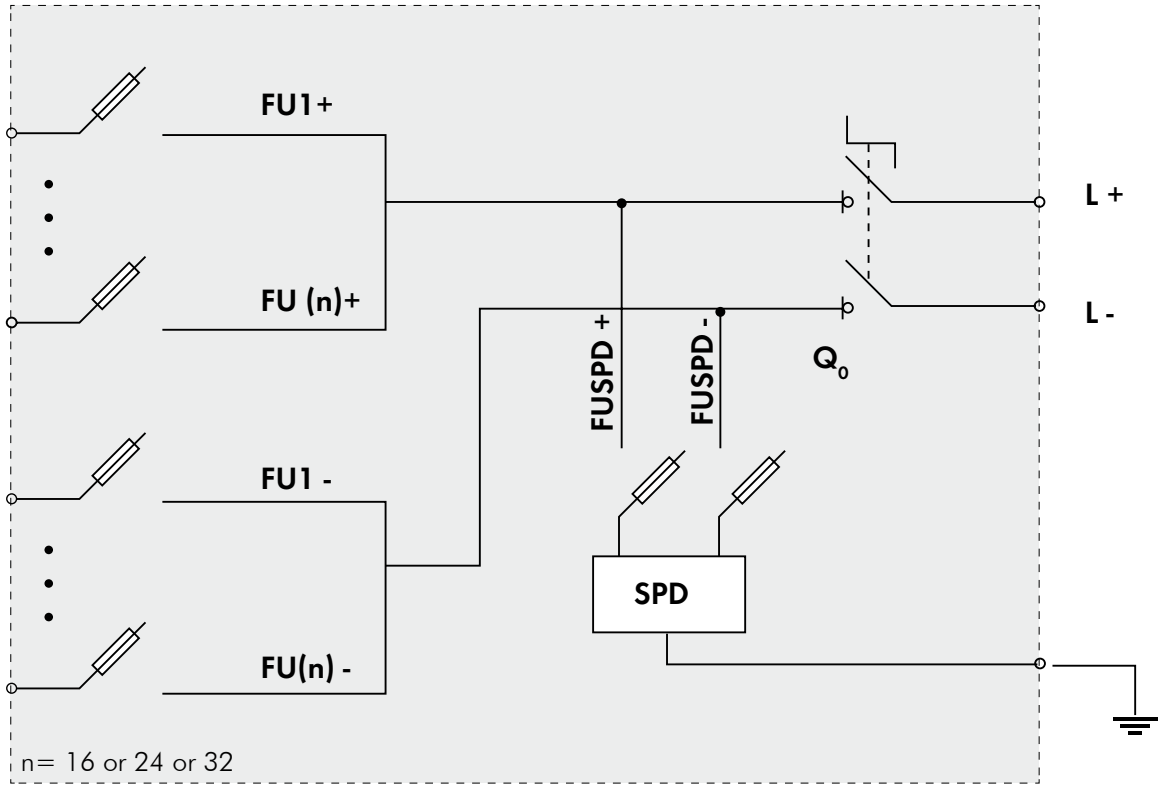


Figure 3: Block circuit diagram of the DC-CMB-U10-16/24/32 Combiner Box

The string fuses in the Combiner Box protect the PV modules of the strings from reverse currents.

4.2 Type Label

There is one type label attached to the Combiner Box.
The type label is located inside the right-hand door of the Combiner Box.
You will find the following information on the type label:

- Manufacturer
- Device type and option code
- Serial number
- Device-specific characteristics

You will require the information on the type label to use the product safely and when seeking customer support from the SMA Service Line. The type label must remain permanently attached to the product.

Symbols on the Type Label

Symbol	Explanation
	Danger to life due to high voltages The product operates at high voltages. All work on the product must be carried out by qualified persons only.
	Risk of burns due to hot surfaces The product can get hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.
	Observe the documentation. Observe all documentation supplied with the product.
	CE marking The product complies with the requirements of the applicable EU directives.
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the locally applicable disposal regulations for electronic waste.

4.3 DC Load-Break Switch

The Combiner Box can be disconnected on the inverter side by means of a DC load-break switch. The use of the DC load-break switch is only permissible if LV/HRC fuses with gPV characteristic are installed upstream in the inverter or main DC distribution box.

4.4 String Fuses

The string fuses protect the PV modules of a PV system from reverse currents. Only install string fuses supplied or approved by SMA Solar Technology AG as accessories for Combiner Box.

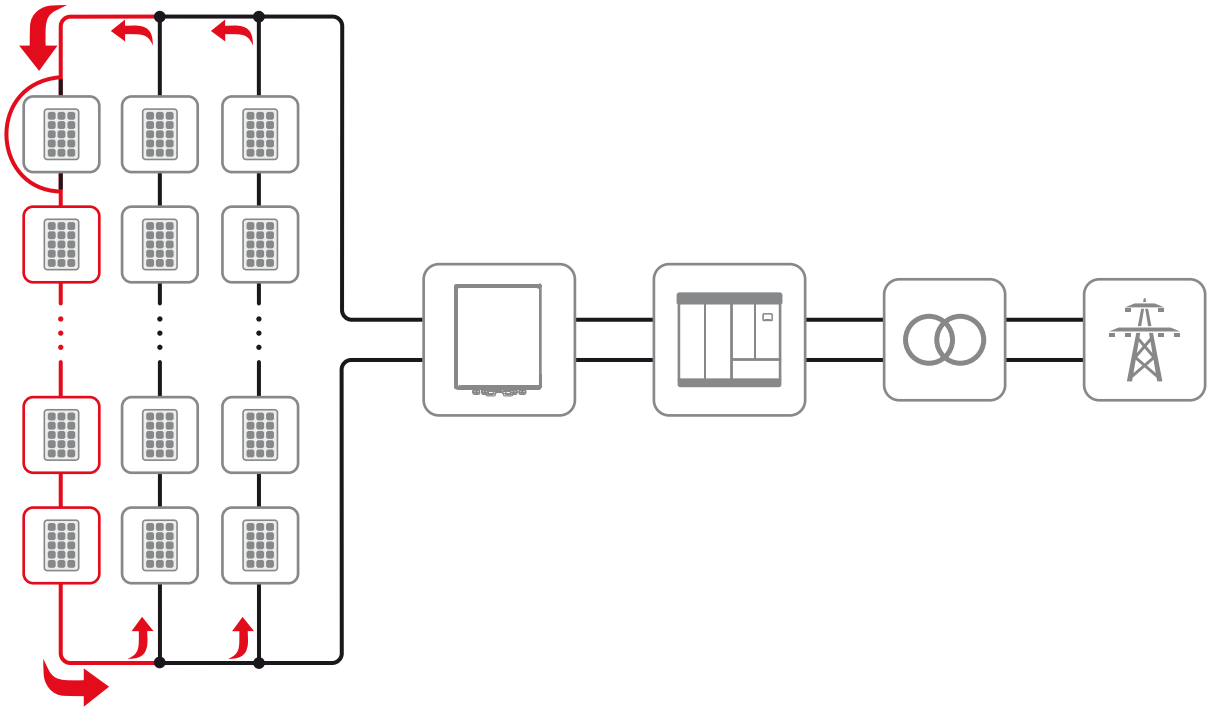


Figure 4: Principle of reverse current

A reverse current can occur when different open-circuit voltages are applied to PV modules connected in parallel. In this event, the reverse current can be much higher than the short-circuit current of the PV modules. The higher the reverse current, the more the PV modules of the faulty string will heat up. Strong heat build-up can destroy the modules of the faulty string.

A reverse current can be caused by the following:

- a short circuit in one or more modules
- a short circuit in one or more cells in a module
- a double ground fault in a module
- a double ground fault in the cabling

The string fuses trip when the string current is too high and protect the PV modules of the faulty string.

4.5 Overvoltage Protection

The Combiner Box is equipped with a surge arrester for overvoltage protection. The surge arrester protects the inverter from transient overvoltages. In order to guarantee the overvoltage protection function, the surge arrester must be connected to the external grounding.

5 Assembly

5.1 Wall Mounting

5.1.1 Selecting the Mounting Location

⚠ WARNING

Fire hazard due to wrong choice of mounting location

Under fault conditions electric arcs may occur in the Sunny String-Monitor. Electric arcs can cause fires if the Sunny String-Monitor is mounted on flammable materials.

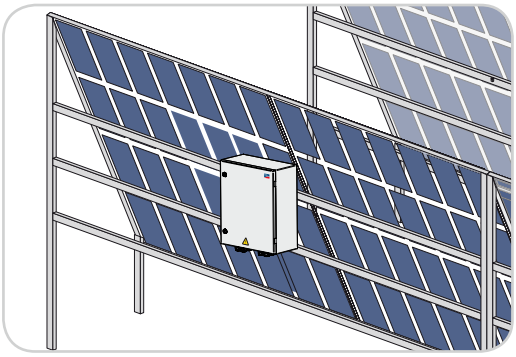
- Do not mount the SMA String-Combiner on flammable construction materials.
- Do not mount the SMA String-Combiner near highly flammable materials.
- Do not mount the SMA String-Combiner in potentially explosive atmospheres.

Requirements for the mounting location:

- ☐ The mounting location must not be in a living or office area.
- ☐ The mounting location must not block any escape routes.
- ☐ The mounting location must be freely and safely accessible at all times without the necessity for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
- ☐ The mounting location must be suitable for the weight and dimensions of the Combiner Box.
- ☐ The mounting location must not be exposed to direct solar irradiation.

Requirements for mounting:

- ☐ Mount the Combiner Box in such a way that the connection area is facing downwards.
- ☐ Do not mount the Combiner Box in a horizontal or inclined position.
- ☐ An external cable support rail must be provided.



Example: Mounting the Combiner Box

If the PV array is mounted on a free-standing structure, the Combiner Box can be fixed to this structure in a shaded position. Make sure that the Combiner Box enclosure is not mounted in the path of rainwater flowing off the module surface.

5.1.2 Mounting the Combiner Box

⚠ CAUTION

Danger of crushing if the Combiner Box is dropped

- When mounting the Combiner Box, take the weight of up to 35 kg into account.
- Two people are needed to mount the Combiner Box.
- Installer should use personal protective equipment.

NOTICE

Damage to cable glands and plug connections due to improper transport and installation

The cable glands and plug connections protrude from the enclosure.

- When transporting and mounting the Combiner Box, ensure that the cable glands and plug connections are not damaged.

Additionally required mounting material (not included in the scope of delivery):

- Four M8 screws. Take wall properties into account when choosing the screw type.
- Four washers
- If necessary, four screw anchors. Take wall properties into account when choosing the screw anchor type.

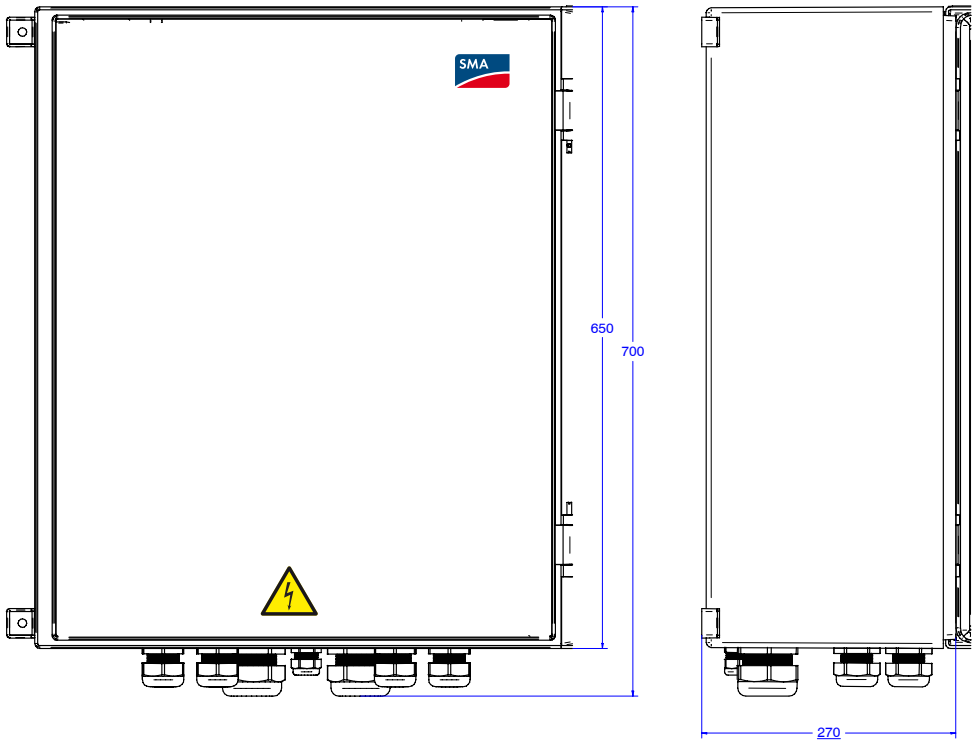


Figure 6a: Dimensions of the Combiner Box 16/24

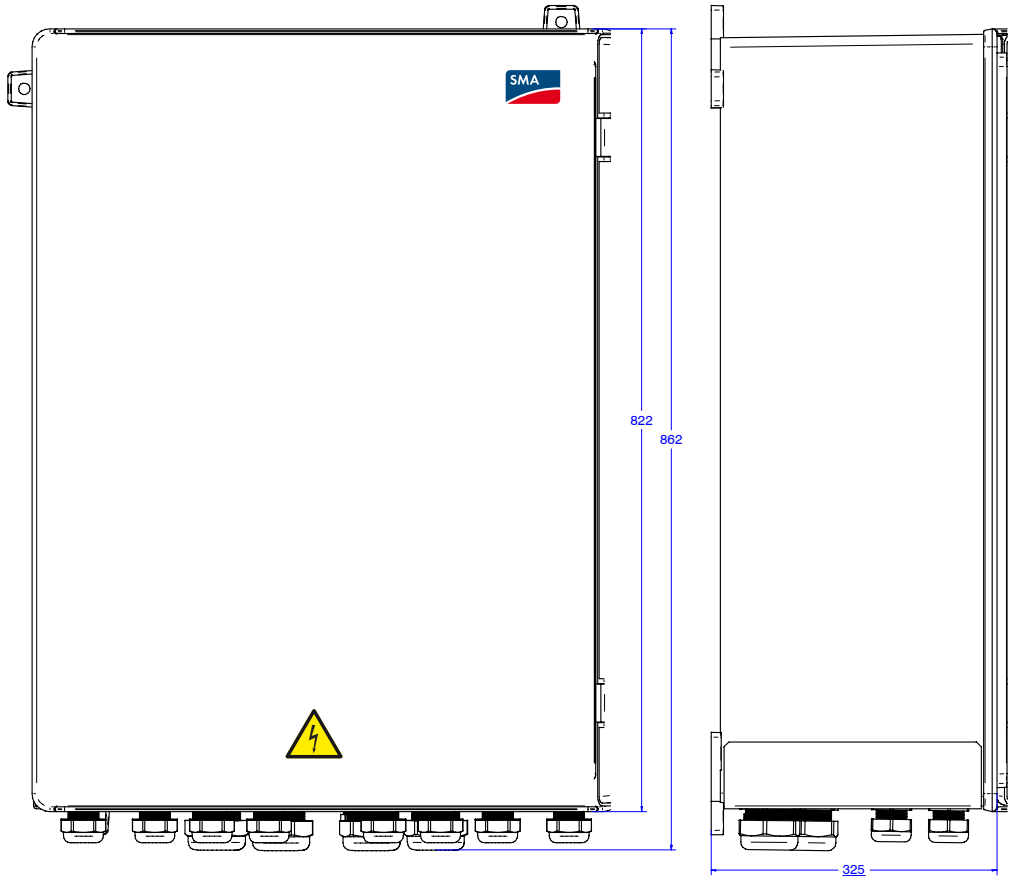
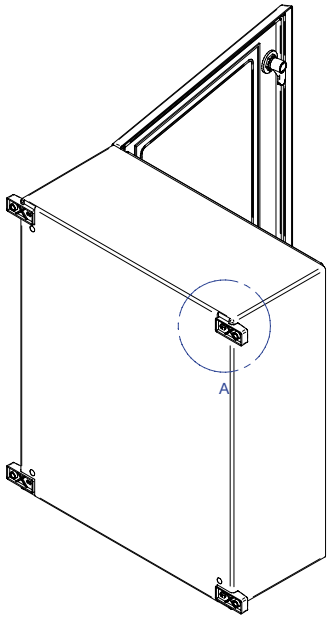


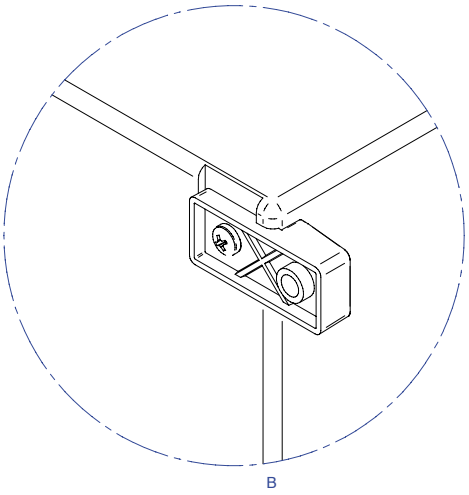
Figure 6b: Dimensions of the Combiner Box 32

Procedure:

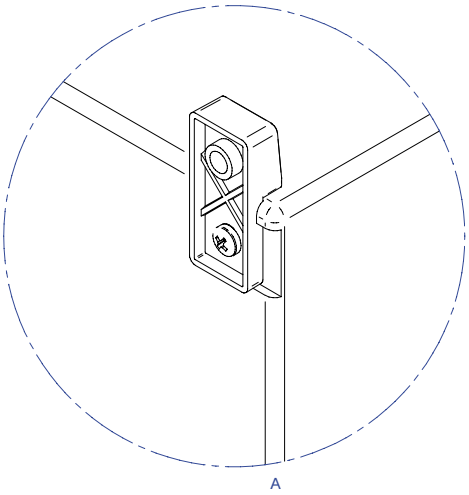
1. Mark the position of the drill holes on the wall or stand.
2. Drill holes at the marked positions.
3. If necessary, insert the screw anchors. Attach the two mounting rails to the Combiner Box with the screws supplied (torque: 15 Nm).
4. Fasten the Combiner Box to the wall or stand using suitable screws and washers.
5. Ensure that the Combiner Box is securely fixed.



Horizontal mounting



Vertical mounting



5.2 Drilling Template for Mounting

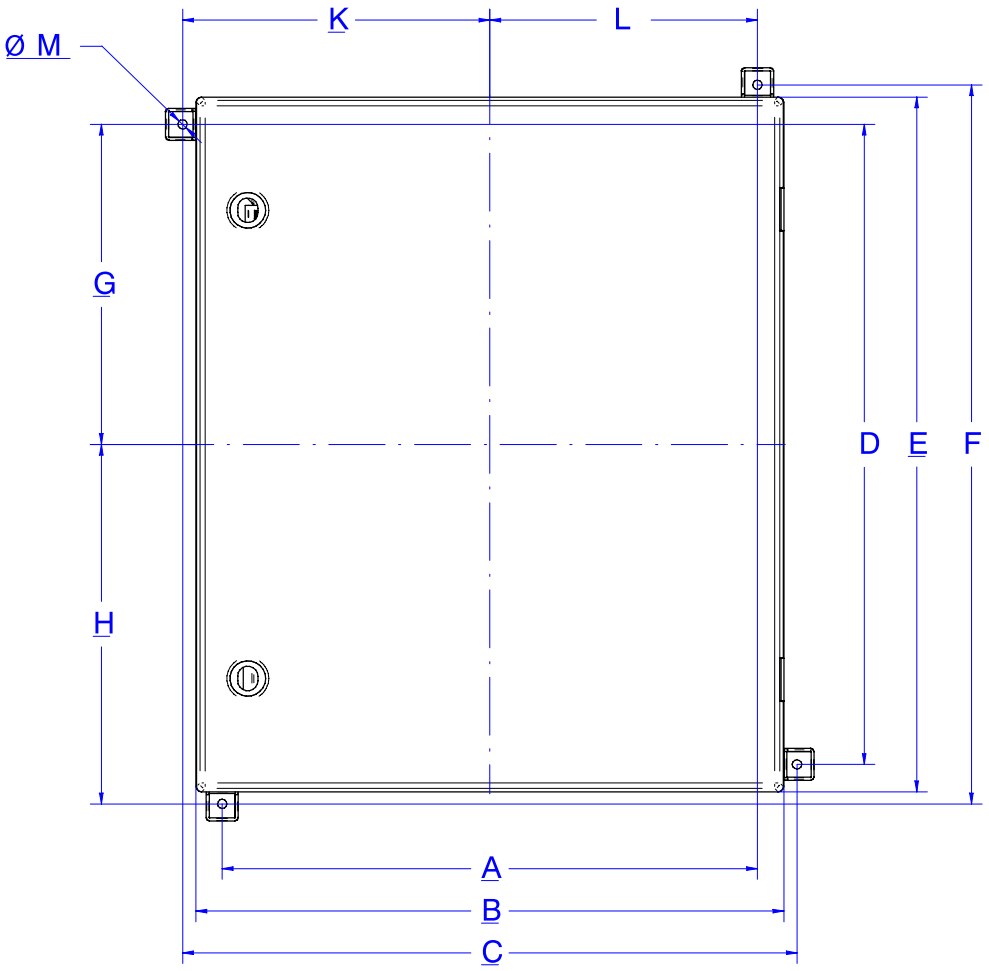


Figure 6c: Dimension

		Dimension (mm)										
		A	B	C	D	E	F	G	H	K	L	M
MODELS	DC-CMB-U10-16 DC-CMB-U10-24	498	550	575	599	650	675	299.5	337.5	287.5	249	8
	DC-CMB-U10-32	494	618	634	696	822	836	348	418	317	247	8

6 Electrical Connection

6.1 Connection Instructions

6.1.1 Preliminary Checks

⚠ DANGER

Before connecting the CMB to the photovoltaic plant, make sure that:

- The fuses are not inserted in the fuse holder.
- The disconnecting switch is open (lever set to OFF).
- The CMB is in good condition and there was no damage during transport.
- The CMB is firmly anchored to walls and stable supports.
- There are no remaining metallic parts, chips and derivatives from the installation activities.

⚠ DANGER

After performing the checks listed in the points above, proceed to wire the cables according to what is shown in the wiring diagram, making sure to use suitable sizes and colors. Before connecting the cables coming from the strings at the top of the fuse holder inside the enclosure, it is recommended to join them end-to-end with suitable tips in order to prevent possible short circuits between adjacent cables.

⚠ CAUTION

Note that the panel does not contain blocking diodes

If the photovoltaic array has zones that are not irradiated evenly (for example, due to partial shading), use blocking diodes to prevent the circulation of inverse currents in the strings which may lower the system's performance.

⚠ CAUTION

Make sure the yellow-green grounding conductor is connected to the arrester and to the terminal.

⚠ CAUTION

Make sure that the DC connections are properly secured inside the terminals in order to prevent possible overheating that may lead to dangerous situations.
Use tools with control torque with the following data:
Fuse holders: 2 Nm
Output DC cable: Screw M12 type 70 Nm

⚠ CAUTION

Before closing the fuse box bases, check the entire side of the photovoltaic array for any wiring errors such as polarity inversion of the strings or excessive voltages above the maximum permissible values. These types of wiring errors can cause serious damage to the system or cause dangerous situations for people.
These types of wiring errors may cause fires.

6.2 Safety during Electrical Connection

⚠ DANGER

Danger to life due to electric shock

High voltages are present in the live components of the Combiner Box. Therefore, work on the Combiner Box is only allowed if the power is disconnected and the guidelines that apply at the installation location are strictly followed.

- Disconnect from voltage sources:
  – Switch off the DC load-break switch in the Combiner Box.
  – With power off, remove the DC fuses in the central inverter or main DC distribution box. Use an LV/HRC fuse handle.
  – Only open the fuse holders when the Combiner Box is switched off.
- Ensure that the device cannot be reconnected.
- Ensure that no voltage is present.
- Ground and short-circuit.
- Cover or isolate any adjacent live components. Protective covers must always be mounted.

6.3 Inserting the Cables into the Switch Cabinet

6.3.1 DC-CMB-U10-16

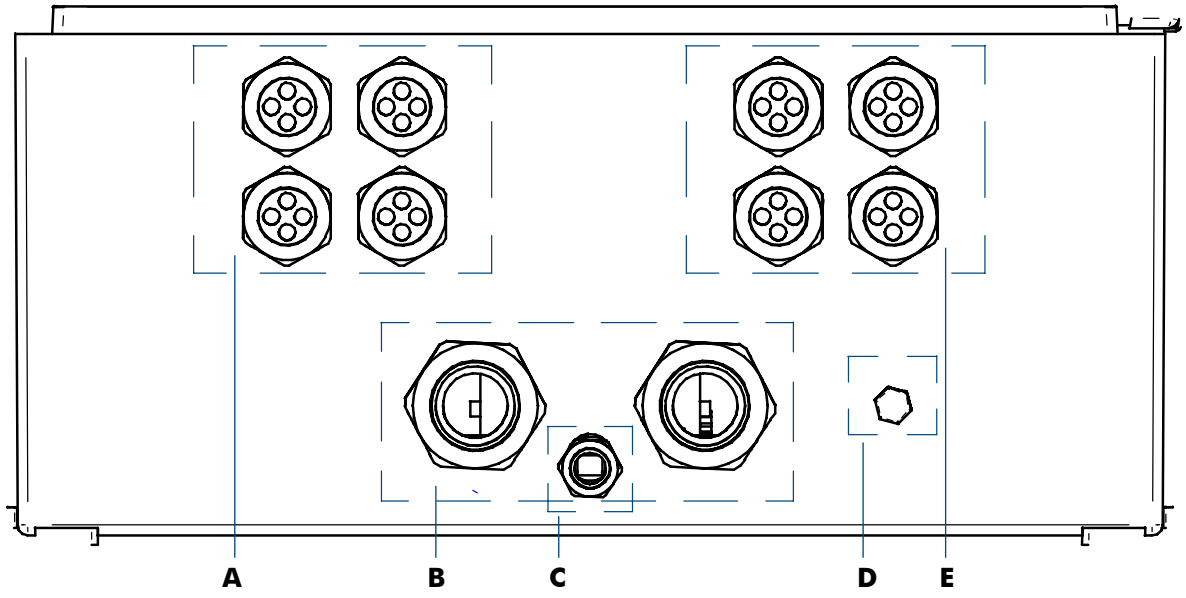


Figure 8: Bottom view of Combiner Box with cable glands (example)

Position	Description
A	Cable entry for connecting the strings (positive terminal)
B	Output DC cable gland
C	Grounding cable gland
D	Protective vent
E	Cable entry for connecting the strings (negative terminal)

6.3.2 Overview of the Connection Area DC-CMB-U10-16

The features of the Combiner Box are dependent on the order option. The maximum configuration of the Combiner Box is shown in the overview diagrams.
Combiner Box with cable glands for the string cables:

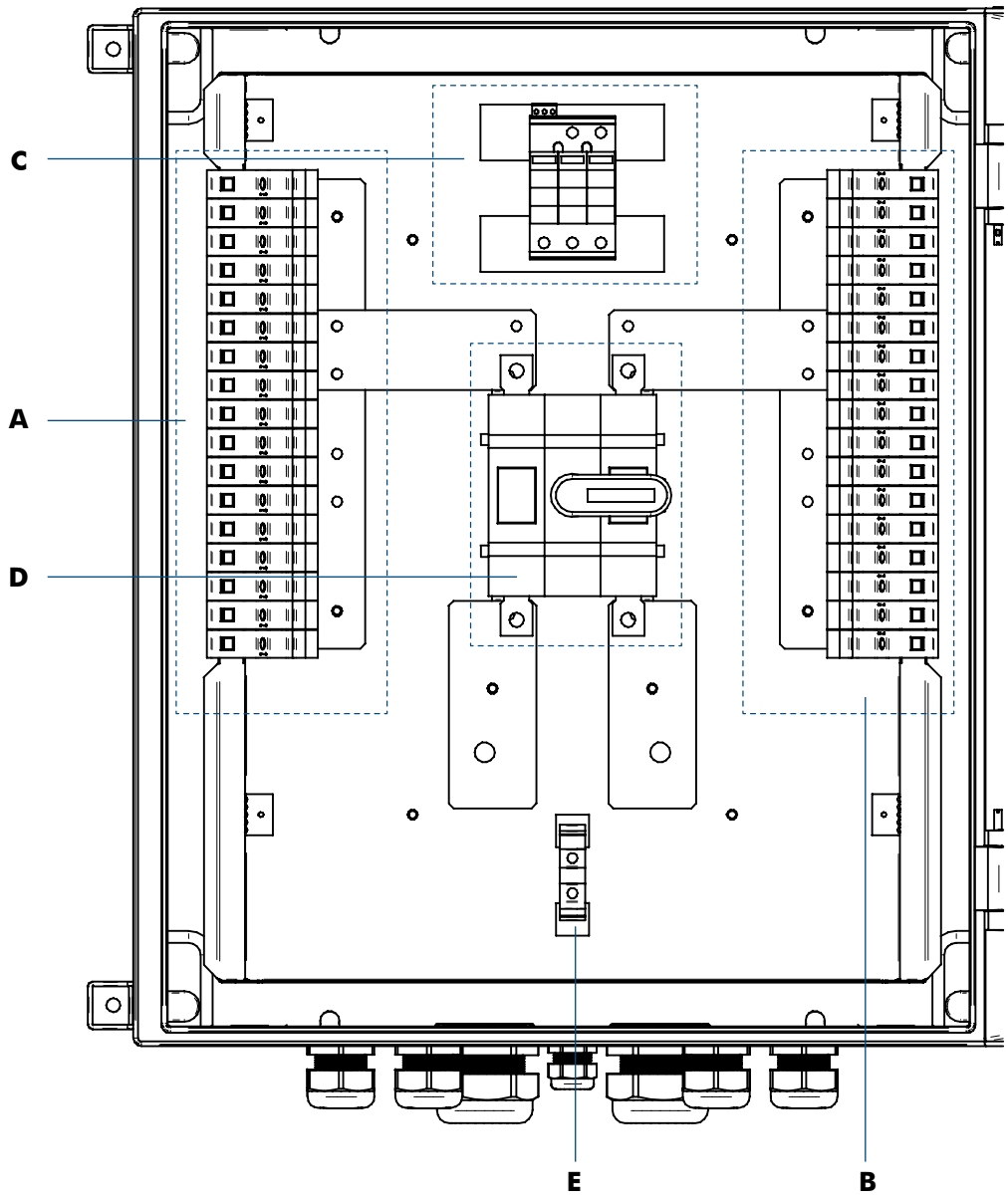
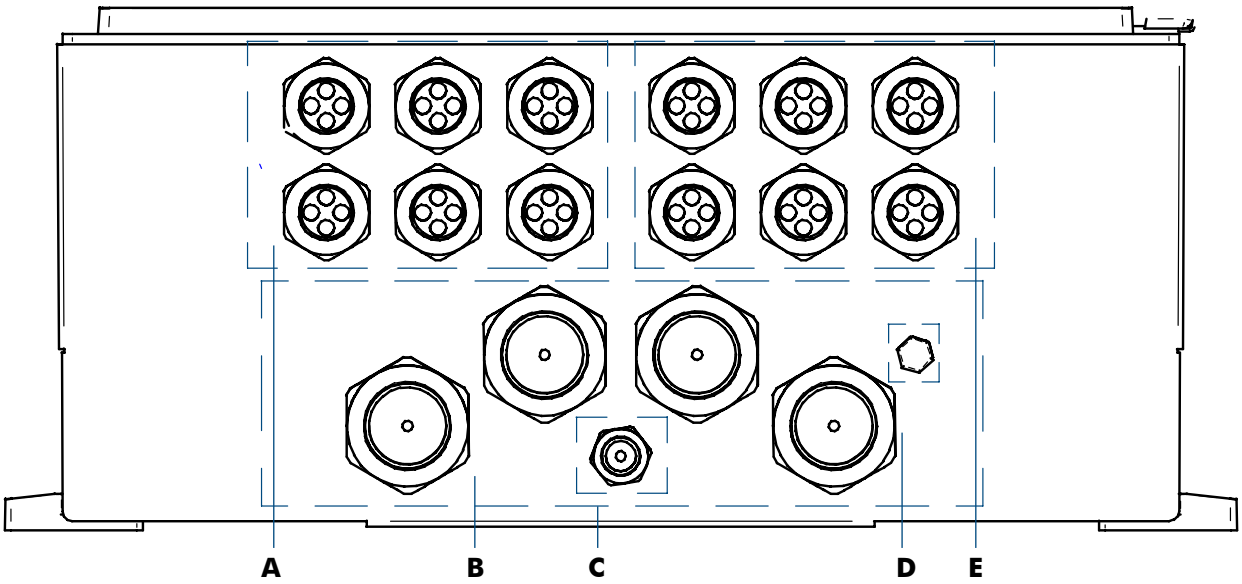


Figure 9: Connections (as exemplified in the DC-CMB-U10-16

Position	Designation
A	Cable entry for connecting the string (positive terminal)
B	Negative input string fuse holder
C	Surge protection device
D	Switch
E	Cable entry for connecting the strings (negative terminal)

6.3.3 Inserting the Cables into the Switch Cabinet DC-CMB-U10-24



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The features of the Combiner Box are dependent on the order option. The maximum configuration of the Combiner Box is shown in the overview diagrams.
Combiner Box with cable glands for the string cables:

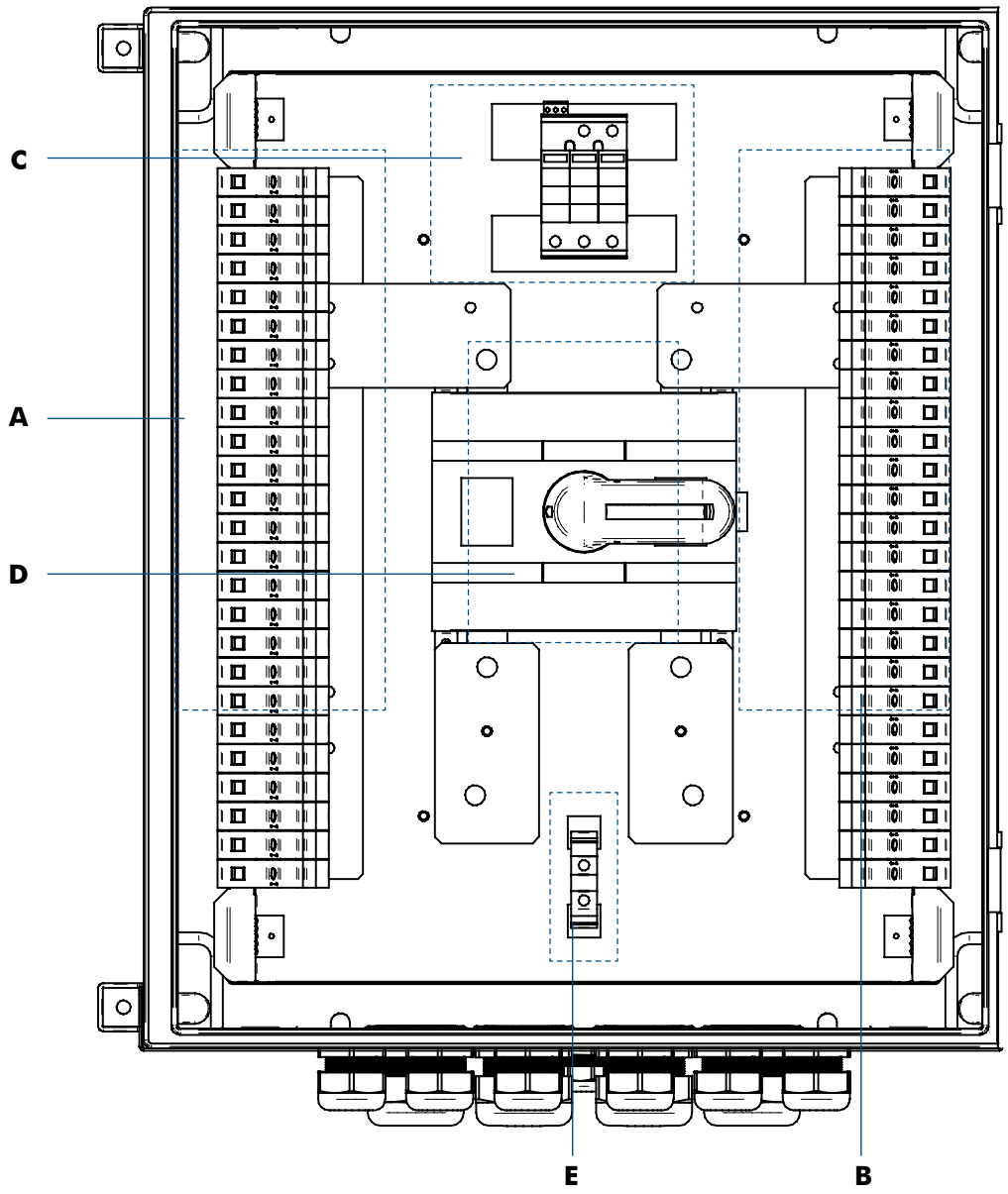


Figure 9: Connections (as exemplified in the DC-CMB-U10-24

Position	Designation
A	Cable entry for connecting the strings (positive terminal)
B	Cable entry for connecting the strings (negative terminal)
C	Surge protection device
D	Switch
E	Grounding terminal

6.3.5 Inserting the Cables into the Switch Cabinet DC-CMB-U10-32

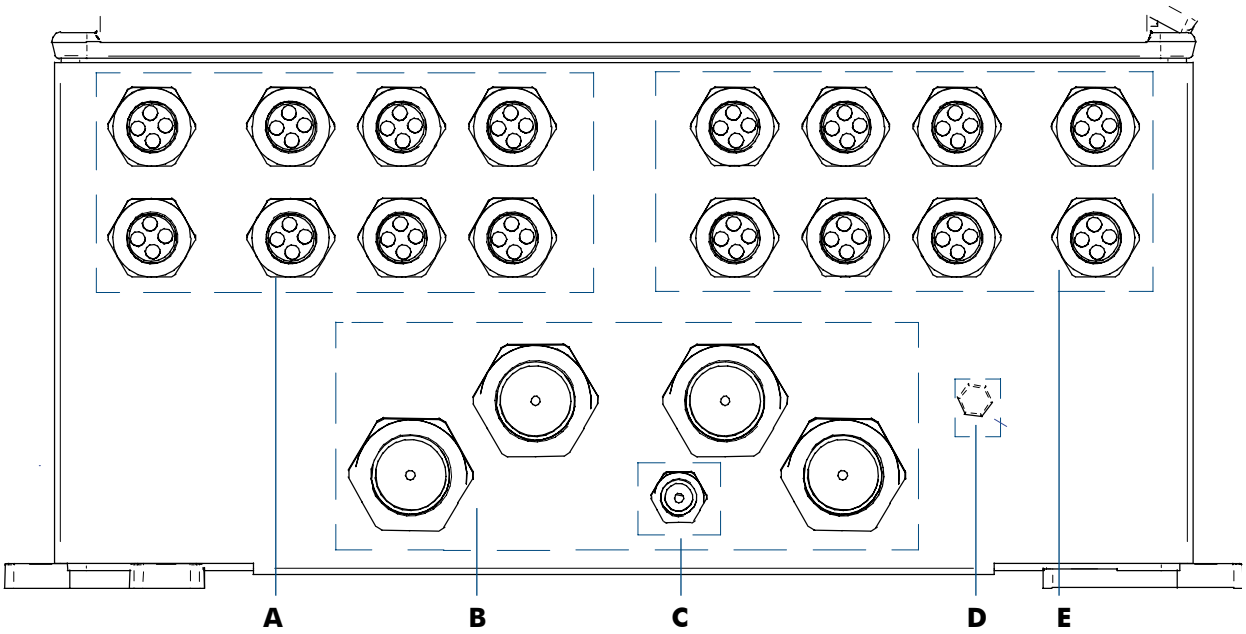


Figure 8: Bottom view of Combiner Box with cable glands (example)

Position	Designation
A	Cable entry for connecting the strings (positive terminal)
B	Output DC cable gland
C	Grounding cable gland
D	Protective vent
E	Cable entry for connecting the strings (negative terminal)

6.3.6 Overview of the Connection Area DC-CMB-U10-32

The features of the Combiner Box are dependent on the order option. The maximum configuration of the Combiner Box is shown in the overview diagrams.
Combiner Box with cable glands for the string cables:

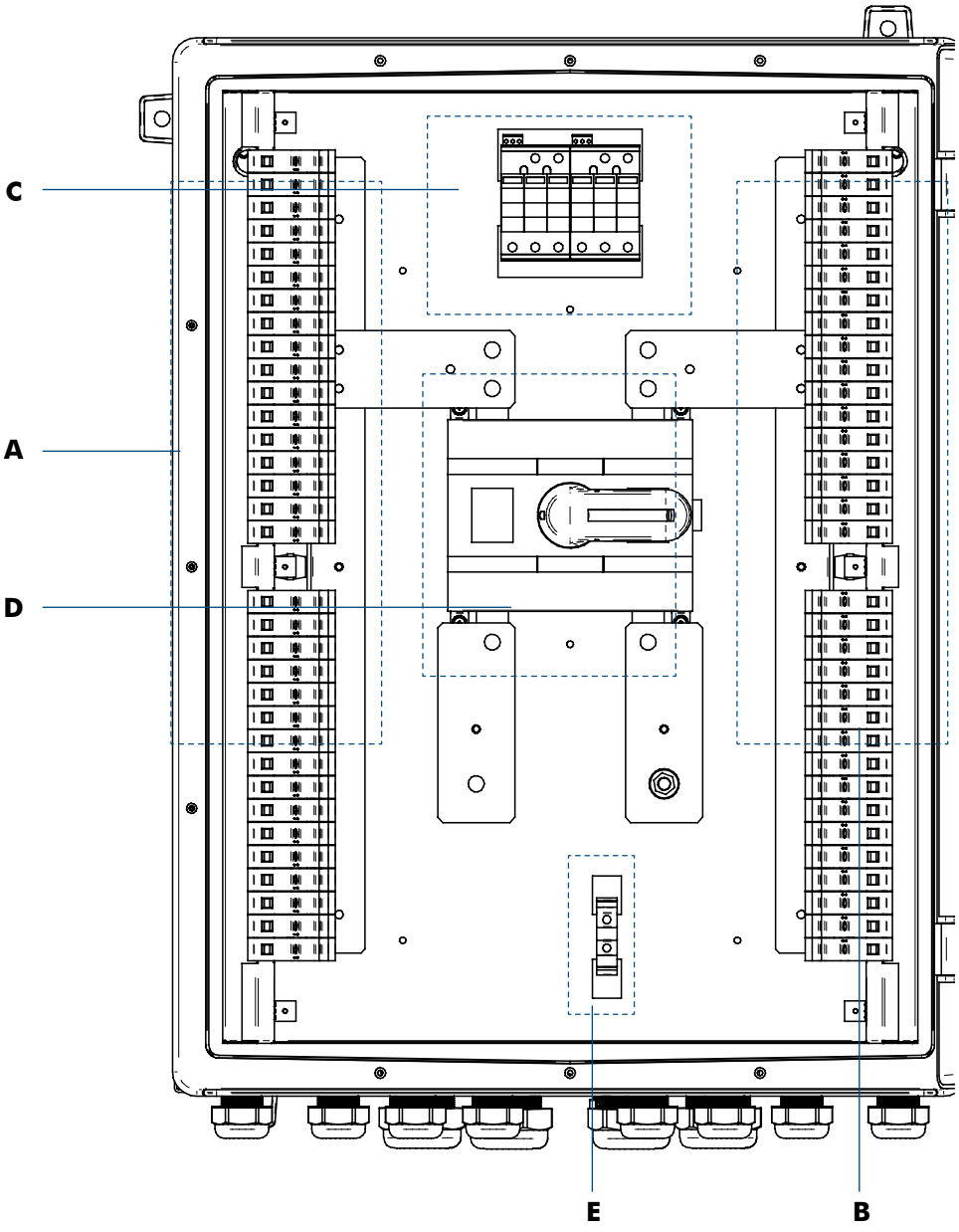


Figure 9: Connections (as exemplified in the DC-CMB-U10-32

Position	Designation
A	Cable entry for connecting the strings + pole
B	Cable entry for connecting the strings − pole
C	Surge protection device
D	Switch
E	Grounding terminal

6.4 Leading the Cables through the Cable Glands with Sealing Ring Cut-Outs

Seal insert for cable glands for DC main cables:
Cable glands for the DC main cables are each supplied with two seal inserts for different cable sizes.

Cable diameter for seal insert:
24.0 mm to 38.5 mm. Use mounted seal insert.
17.0 mm to 31.0 mm. Replace seal insert for the seal insert supplied in the scope of delivery.

Procedure:
1. Release the cable gland.
2. Remove the filler plug from the cable gland.
3. When inserting the DC main cables, replace the seal insert with the insert in the scope of delivery if necessary (see above table).
4. Lead the cable through the swivel nut of the cable gland. Ensure that the thread of the swivel nut is facing upwards.
5. Lead the cable through the seal insert.
6. Insert the seal insert into the cable gland together with the cable.
7. Cut the cable to length.
8. Tighten the cable gland with the appropriate torque:
   • Cable gland for DC main cable: 7.5 Nm

6.5 Connecting the String Cables

SMA Solar Technology AG recommends using bootlace ferrules for connecting the string cables to the fuse holders.

6.5.1 Cable requirements:

☐ PV cable type must be available.
☐ Conductor cross-section of the string cable for connection of one string cable to the fuse holders: 4 mm^2 to 6 mm^2.

Procedure:
1. Attach the string cables to an external cable support rail.
2. Cut the string cables to length and strip 11 mm off the insulation.
3. If you are using bootlace ferrules, mount the bootlace ferrules and crimp gas-tight.
4. Connect the string cables to the screw terminals of the fuse holders (torque: 2.5 Nm). Ensure correct polarity.

6.6 Connecting the DC Main Cables

6.6.1 Cable Requirements

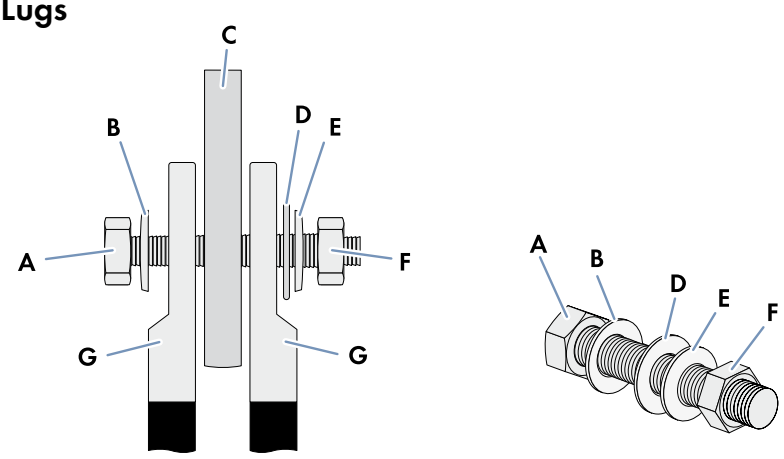
The Combiner Box comes supplied with busbars for connecting the DC cables with terminal lugs. If you wish to connect the DC cables directly to the terminals, the appropriate terminals are available as accessories.

Requirements for DC main cables and terminal lugs:
☐ Use copper or aluminum cables only.
☐ Use only tin-plated copper ring terminal lugs for copper cables or bimetal ring terminal lugs for aluminum cables.
☐ The width of the terminal lug contact surface must exceed the diameter of the washers (32 mm).

Requirements for DC main cables for direct connection to terminals which are available as accessories:
☐ Use copper or aluminum cables only.
☐ The conductor cross-sections of the DC main cables must be selected correctly.
☐ The width of terminal lug must not exceed 45 mm.

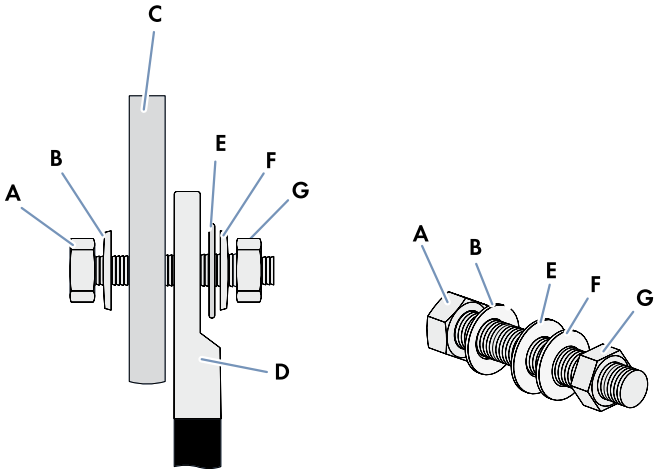
6.7 Assembly of the Connection

6.7.1 Two Terminal Lugs



Position	Designation
A	Screw M12
B	Washer
C	Tin-plated copper busbar
D	Fender washer
E	Spring washer
F	Nut M12
G	Tin-plated tube terminal lug

6.7.2 One Terminal Lug



Position	Designation
A	Screw M12
B	Washer
C	Tin-plated copper busbar
D	Tin-plated tube terminal lug
E	Fender washer
F	Spring washer
G	Nut M12

6.7.3 Connection procedure:

1. Ensure that the DC subdistribution is switched off and secured against reconnection (see Section 8 "Disconnecting and Reconnecting").
2. Ensure that the inverter is disconnected on the DC side and secured against reconnection (see inverter manual).
3. Lead the DC main cables into the DC subdistribution through the designated enclosure opening (see Section 6) with the appropriate seal insert (see Section 6).
4. Fit the DC main cables with tube terminal lugs. Make sure that no pieces of cable are dropped into the DC subdistribution.
5. In the DC subdistribution, remove the fastening material for the DC main cables from the busbars.
6. Clean the contact surfaces using a clean cloth and ethanol cleaning agent. Do not touch the contact surfaces after cleaning.

Additionally required material (not included in the scope of delivery):

☐ Ring terminal lugs (size: for M12 screw)
☐ Clean cloth
☐ Ethanol cleaning agent

Procedure:

1. Strip off the DC cable insulation.
2. Fit the DC main cables with ring terminal lugs.
3. Clean the contact surfaces using a clean cloth and ethanol cleaning agent. Do not touch the contact surfaces after cleaning.
4. Connect the DC main cables in accordance with the circuit diagram (torque: 60 Nm). Ensure that you only use the supplied fastening material and connect a maximum of two adjacent DC main cables to each busbar.
5. Secure the DC main cables to the cable support rail.

6.8 Connecting the Grounding Cable

In order to guarantee the function of the surge arrester, it must be connected to the external grounding.

Cable requirement:

☐ Conductor cross-section:16 mm^2 to 35 mm^2.

Procedure:

1. Strip 16 mm off the grounding cable insulation.
2. Connect the grounding cable to the screw terminal of the surge arrester (torque: 2.5 Nm).
3. Ensure that the grounding cable is securely clamped.
4. Ground the grounding cable in the vicinity of the Combiner Box, e.g. by means of a grounding electrode.

7 Commissioning

7.1 Safety during Commissioning

⚠ DANGER

Danger to life from electric shock due to live voltage

- High voltages are present in the live components of the Combiner Box. Touching live components results in death or serious injury due to electric shock.
- Wear personal protective equipment when working on the Combiner Box.
- Do not touch live components.
- Before performing any work, always disconnect the Combiner Box from voltage sources unless supply
- voltage is absolutely necessary.
  – Switch off the DC load-break switch in the Combiner Box.
  – With power off, remove the DC fuses in the central inverter or main DC distribution box. Use the LV/HRC fuse handle to do this.
  – Only open the fuse holders when the Combiner Box is switched off.
- Ensure that the device cannot be reconnected.
- Ensure that no voltage is present.
- Ground and short-circuit.
- Cover or isolate any adjacent live components. Protective covers must always be mounted.

7.2 Commissioning the Combiner Box

7.2.1 Requirements for Commissioning

Commissioning must be performed by Service employees only
Commissioning of the Combiner Box must be performed by Service employees of SMA Solar Technology AG or their authorized representatives only.

The commissioning report must be completed during commissioning.

Requirements:
☐ The DC load-break switch is switched off.
☐ The DC main cables are connected to the inverter or main DC distribution box and disconnected from voltage sources.
☐ There is no reverse voltage from the inverter.
☐ All connections have been made in accordance with this manual (see Section 6 “Electrical Connection”, page 17).
☐ The correct polarity of all connections has been ensured and documented.
☐ The floor around the Combiner Boxs is firm and freely accessible.

7.3 Voltage Check – Measuring Procedure

Use a voltmeter with a voltage range up to 1,500 V_{DC}. This check is made by measuring the open-circuit voltage of the panels obtained at minimum irradiation.

Requirements:
· Make sure that the inverter is switched off and disconnected on the DC side.
· Make sure that the disconnecting switch of the combiner is set to OFF.
· Make sure that the fuse box bases are open.

7 Commissioning

Measure the open-circuit voltage of each string and check the following points:
· The maximum deviation between the voltages is less than 10%.
· No values higher than the maximum permissible are measured.
· No negative values are measured.

⚠ DANGER

The fuses can be inserted in the fuse boxes only if the previous tests have generated positive results.
Proceed with the start-up operations of the system.

⚠ DANGER

Immediately correct the wiring if one of the aforesaid conditions is not valid because continuation of this situation may cause serious damage to the system and people.

⚠ DANGER

The fuse holders are not suitable for isolating the on-load string current. Therefore, these bases should only be opened if there is no passage of current (main disconnecting switch OFF) in order to prevent the creation of electrical arcs that are dangerous to the health and safety of people and the intactness of components.

8 Maintenance

8.1 Periodic Maintenance

It is recommended to periodically inspect the panel and check the following points:

- There are no evident signs of rust or corrosion which may impair functioning and safety.
  (Yearly - Visual inspection)
- There are no water infiltrations and excessive dust infiltration.
  (Yearly - Visual inspection)
- The mass grounding and drains are efficient.
  (Yearly - Visual inspection)
- There is insulation between the electrical circuits and masses.
  (5 Year - Insulation test)
- All the DC and AC connections are correctly tightened.
  (Yearly - Dynamometric torque tool)
- There are no burn marks on the terminals.
  (Yearly - Visual inspection)
- The door panel of the enclosure is firmly closed at the end of all the checks and after any maintenance.
  (Yearly - Visual inspection)

8.2 Extraordinary Maintenance

If damaged components need to be replaced (for example, fuses, SPD, etc.) only use materials identical to those originally supplied. A list of these materials is available in the wiring Diagram. If in doubt, contact the manufacturer.

If the electrical connections are damaged due to mechanical or electrical causes or due to rodents, immediately disconnect the system or at least the damaged part. After verifying that no failures were caused to the equipment, proceed with the replacement of the wires using similar materials.

⚠ CAUTION

All the maintenance operations must be performed by taking into account all safety instructions, checking beforehand that the components are not powered.

9 Disconnecting

⚠ DANGER

Danger to life due to electric shock when touching live components of the Combiner Box

• Observe the following safety rules when disconnecting:

– Disconnect from voltage sources.

– Ensure that the device cannot be reconnected.

– Check that no voltage or current is present.

– Ground and short-circuit.

– Cover or isolate any adjacent live components.

⚠ CAUTION

Risk of burns from touching hot components

• Wear personal safety equipment when working on the device.

Procedure:

1. Switch off the DC load-break switch. This ensures that there is no current flow through the Combiner Box.
2. Disconnect the Sunny Central from voltage sources (see Sunny Central installation manual).
   If there are fuses in the Sunny Central, remove them. Use the LV/HRC fuse handle to do this.
   or
   If there are no fuses in the Sunny Central, remove the fuses in the DC main distributor.
3. Only open the fuse holders in the Combiner Box with power switched off.

10 Decommissioning

10.1 Disassembling the Combiner Box

Requirement:
The DC-CMB-U10-16/24/32 Combiner Boxes must be disconnected from voltage sources.

Procedure:
1. Open the doors of the Combiner Box.
2. Disconnect the string cables from the fuse holders.
3. Disconnect the DC main cable.
4. Disconnect the grounding cable.
5. Release the cable glands.
6. Pull all cables out of cable glands and cable feed-through plates and property isolate them.
7. Disassemble the Combiner Box.

10.2 Disposing of the Combiner Box

• Dispose of the Combiner Box in accordance with the applicable disposal regulations for electronic waste.

11 Technical Data

GENERAL DATA			
	DC-CMB-U10-16	**DC-CMB-U10-24**	**DC-CMB-U10-32**
Max. voltage (V_N)		DC 1,000 V (Note 1)	
Max. input short-circuit current (IscSTC)	12.5 A	12.5 A	12.5 A
Max. output short-circuit current (IscSTC)	220 A	300 A	360 A

MECHANICAL DATA			
Enclosure		GRP (Glass Fiber Reinforced Polyester)	
Enclosure Dimensions (W x D x H in mm)		550 x 260 x 650	590 x 285 x 790
Weight	24.2 kg	26.9 kg	34 kg
Degree of Protection		IP 54 (outdoor installation)	
Protection Class		CLASS II	
Color (RAL)		RAL 7035	

ENVIRONMENT DATA	
Ambient temperature during normal operation	-25°C to 60°C (Note 2)
Ambient temperature during storage	-40°C to 70°C
Humidity	0 % to 95 % non-condensing
Altitude	up to 4,000 m

DC INPUT DATA			
Number of strings	16	24	32
Sealing range cable entry		5 mm to 8 mm	
Input cable glands entry (per pole)	4 PG32 with 4 input each	6 PG32 with 4 input each	8 PG32 with 4 input each
Input connection		Directly on Fuse Holder	
Conductor cross-section		4 mm^2 to 6 mm^2	
Fuse holder		DIN Rail Mounting - 1 pole - 1000 V_{DC}	
Fuse type		10.3 x 38 - 1,000 V_{DC} - gPV	
Fuse size	10 A to 25 A	10 A to 20 A	10 A to 20 A

DC OUTPUT DATA			
Output cable glands	Nr. 1 M50x1.5 (with reduction) per pole	Nr. 2 M50x1.5 (with reduction) per pole	Nr. 2 M50x1.5 (with reduction) per pole
Clamping Area	17 mm to 38 mm	17 mm to 38 mm	17 mm to 38 mm
Conductor Material		Copper or aluminium	
Terminal Type		Copper busbar with M12 screw	
Switch Type		Under Load Switch-Disconnector - 2 pole - 1,000 V_{DC}	
SPD Protection		SPD Type II 15 kA/40 kA	

(Note 1) Derating of V_N versus altitude. 1.0 % per 100 m from 2,001 m to 3,000 m.
1.2 % per 100 m from 3,001 m to 4,000 m.
(Note 2) Derating of 1%/K of max. current from 50°C to 60°C.

12 Contact

If you have technical problems concerning our products, contact our SMA Service Line. We need the following data in order to provide you with the necessary assistance:

- Combiner Box type
- Serial number of the Combiner Box
- Type and number of PV modules connected

Australia	SMA Australia Pty Ltd. Sydney	Toll free for Australia: International:	1800 SMA AUS (1800 762 287) +61 2 9491 4200
Belgien/ Belgique/ België	SMA Benelux BVBA/SPRL Mechelen	+32 15 286 730	
Brasil	Vide España (Espanha)		
Česko	SMA Central & Eastern Europe s.r.o. Praha	+420 235 010 417	
Chile	Ver España		
Danmark	Se Deutschland (Tyskland)		
Deutschland	SMA Solar Technology AG Niestetal	Medium Power Solutions Wechselrichter: Kommunikation: SMA Online Service Center:	 +49 561 9522-1499 +49 561 9522-2499 www.SMA.de/Service
		Hybrid Energy Solutions Sunny Island: PV-Diesel Hybridsysteme:	 +49 561 9522-399 +49 561 9522-3199
		Power Plant Solutions Sunny Central:	 +49 561 9522-299
España	SMA Ibérica Tecnología Solar, S.L.U. Barcelona	Llamada gratuita en España: Internacional:	 900 14 22 22 +34 902 14 24 24
France	SMA France S.A.S. Lyon	Medium Power Solutions Onduleurs : Communication :	 +33 472 09 04 40 +33 472 09 04 41
		Hybrid Energy Solutions Sunny Island :	 +33 472 09 04 42
		Power Plant Solutions Sunny Central :	 +33 472 09 04 43
India	SMA Solar India Pvt. Ltd. Mumbai		 +91 22 61713888
Italia	SMA Italia S.r.l. Milano		 +39 02 8934-7299
Κύπρος/ Kıbrıs	Βλέπε Ελλάδα/ Bkz. Ελλάδα (Yunanistan)		
Luxemburg/ Luxembourg	Siehe Belgien/ Voir Belgien (Belgique)		

Magyarország	lásd Česko (Csehország)		
Nederland	zie Belgien (België)		
Österreich	Siehe Deutschland		
Perú	Ver España		
Polska	Patrz Česko (Czechy)		
Portugal	SMA Solar Technology Portugal, Unipessoal Lda Lisboa	Isento de taxas em Portugal: Internacional:	 800 20 89 87 351 2 12 37 78 60
România	Vezi Česko (Cehia)		
Schweiz	Siehe Deutschland		
Slovensko	pozri Česko (Česká republika)		
South Africa	SMA Solar Technology South Africa Pty Ltd. Centurion (Pretoria)	08600 SUNNY (08600 78669) International:	 +27 (12) 643 1785
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Ελλάδα	SMA Hellas AE Αθήνα	801 222 9 222 International:	 +30 212 222 9 222
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